

Appl. No. 09/889,080
Amendment and/or Response
Reply to Office action of 19 July 2004

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Amendments to the Claims:

A listing of the entire set of pending claims (including amendments to the claims, if any) is submitted herewith per 37 CFR 1.121. This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1-2. (Canceled)

3. (Currently amended) A liquid crystal displaying apparatus according to claim 1 characterized in that capable of displaying a color image, comprising:

a liquid crystal panel in which each main pixel unit including a red sub-pixel, a green sub-pixel, a blue sub-pixel and a luminance-enhancing sub-pixel, and
calculation means for calculating digital output values Ro, Go and Bo for
driving said red sub-pixel, said green sub-pixel and said blue sub-pixel, respectively,
from digital input values Ri, Gi and Bi respectively for said red sub-pixel, said green
sub-pixel and said blue sub-pixel and a predetermined digital value W for driving said
luminance-enhancing sub-pixel so that a relationship of Ri:Gi:Bi =
(Ro+W):(Go+W):(Bo+W) is satisfied, said values Ri, Gi and Bi being obtained from
an input color image.

wherein said digital value W is obtained in accordance with a function
represented by a formula W = f(Ymax, Ymin) where Ymax and Ymin are a maximum
value and a minimum value, respectively, of said digital input values for said red sub-
pixel, said green sub-pixel and said blue sub-pixel.

4. (Original) A liquid crystal displaying apparatus according to claim 3 characterized in that said function represented by said formula $W = f(Y_{max}, Y_{min})$ is a function which monotonously increases as a value of said Y_{max} value or said Y_{min} value becomes larger.

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5. (Original) A liquid crystal displaying apparatus according to claim 3 characterized in that said formula of W is given by a function in which said Ymin is a variable with said Ymax being a constant and in that said function represented by said formula $W = f(Y_{max}, Y_{min})$ is a function which monotonously increases as a value of said Ymin becomes larger.

6. (Canceled)

7. (New) A display device comprising:

a plurality of picture elements,

each picture element including a plurality of color sub-pixels and a white sub-pixel,

a decoder that is configured to receive a plurality of input color values and to produce therefrom a plurality of color pixel values that are used to drive corresponding color sub-pixels, and white pixel values that are used to drive the corresponding white sub-pixels,

wherein

the decoder is configured to:

determine a minimum color value and a maximum color value for each picture element,

produce the color pixel values for each picture element dependent upon the input color values and the maximum color value, and

produce the white pixel value for each picture element based on the minimum color value.

8. (New) The display device of claim 7, wherein

the decoder is configured to produce the color pixel values for each picture element dependent also upon the white pixel value.

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9. (New) The display device of claim 8, wherein

the decoder is configured to produce the white pixel value for each picture element dependent also upon the maximum color value.

10. (New) The display device of claim 9, wherein

the white pixel value is $\leq Y_{min} \cdot Y_{max} / (Y_{max} - Y_{min})$ when $Y_{min}/Y_{max} \leq 0.5$,
and

the white pixel value is $\leq Y_{max}$ when $Y_{min}/Y_{max} > 0.5$,
where Y_{min} , Y_{max} corresponds to the minimum color value and the maximum color value, respectively.

11. (New) The display device of claim 10, wherein

each color pixel value corresponds to $C_i \cdot (W + Y_{min}) / Y_{max} - W$,
where C_i , W , Y_{min} , and Y_{max} correspond to the input color value, the white pixel value, the minimum color value and the maximum color value, respectively.

12. (New) The display device of claim 7, wherein

the decoder is configured to produce the white pixel value for each picture element dependent also upon the maximum color value.

13. (New) The display device of claim 12, wherein

the white pixel value is $\leq Y_{min} \cdot Y_{max} / (Y_{max} - Y_{min})$ when $Y_{min}/Y_{max} \leq 0.5$,
and

the white pixel value is $\leq Y_{max}$ when $Y_{min}/Y_{max} > 0.5$,
where Y_{min} , Y_{max} corresponds to the minimum color value and the maximum color value, respectively.

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14. (New) The display device of claim 7, wherein
 - each color pixel value corresponds to $C_i * (W + Y_{min}) / Y_{max} - W$, where C_i , W , Y_{min} , and Y_{max} correspond to the input color value, the white pixel value, the minimum color value and the maximum color value, respectively.
15. (New) The display device of claim 7, wherein
 - the decoder is configured to provide the color pixel values for each picture element such that a ratio of the color pixel values to each other corresponds to a ratio of the input color values to each other.
16. (New) A method of determining a set of output values for driving sub-pixels of a pixel based on input color values, comprising:
 - determining a minimum color value and a maximum color value based on the input color values,
 - determining each output color value of the set of output values based on the corresponding input color value and the maximum color value, and
 - determining an output white value of the set of output values based on the minimum color value.
17. (New) The method of claim 16, wherein
 - determining each output color value includes
 - determining each output color value so that a ratio of each output color value to each other corresponds to a ratio of each input color value to each other.
18. (New) The method of claim 16, wherein
 - determining each output color value is also based on the output white value.
19. (New) The method of claim 16, wherein
 - determining the output white value is also based on the maximum color value.

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20. (New) The method of claim 16, wherein
determining each output color value includes
calculating $C_o = C_i * (W + Y_{min}) / Y_{max} - W$,
where C_o , C_i , W , Y_{min} , and Y_{max} correspond to the output color value, input
color value, the white pixel value, the minimum color value and the maximum color
value, respectively.